PROJECT PROGRESS REPORT

PROJECT TITLE: Production Of Vegetable Soybean As A Potential Specialty Crop In Virginia

INSTITUTION: AGRICULTURAL RESEARCH STATION OF VIRGINIA STATE UNIVERSITY-

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I: PROJECT SUMMARY:

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Vegetable soybean or edamame market conditions in the U.S. are changing and growing. The existing market has been growing at 20% yr^{-1} and the growth is focused on conventional shelled edamame and for organically grown edamame both in pods and shelled. Currently, edamame production is limited to small-scale, fresh market production. However, The outlook for fresh edamame producer profitability is outstanding (Figs 1 & 2). Vegetable soybeans have two potentials in the State of Virginia in particular and the nation in general. One is to increase the variety of vegetable by adding green soybean in early fall when other green vegetables are scarce. Second, mature soybean could be used for different soyfood products that would increase the diets' protein and calories of low-income population, vegetarians, and other health conscious individuals.

Fig 1. Inking the deal between the *Columbus County, South Carolina Committee Chair and Ever Fresh Inc, a South Korea Company that will process edamame for export*

Fig 2. Asian Salad marketed by McDonald Restaurants

In general vegetable soybean has an excellent market gate opportunity in Virginia, provided food quality cultivars are developed to fulfill the national and international market demands. The cultural practices for vegetable soybean are identical to traditional soybean except that the green pods are harvested at green stage when the pods are almost filled.

The objectives of this project are to: 1) determine the efficiency of common bean harvester and sheller in harvesting and shelling vegetable soybean and 2) identify agronomic and architectural traits that are suitable for mechanical harvest.

II. APPROACH TO PROJECT OBJECTIVES:

Objective 1:To determine the efficiency of common bean harvester in harvesting vegetable soybean cultivars.

Several breeding lines have high seed yield and seed size, and seed coat color (black, yellow, green and brown), were developed as vegetable soybean by the ongoing Evans-Allen soybean breeding program. Six cultivars and breeding lines which possessed different maturity groups (MGs) were selected from the available VSU-breeding lines and planted in four-row plots at Randolph Research Farm of VSU, Petersburg, Virginia. Each four-row plot is 60 m x 4.5 m long, with a spacing of 75 cm between rows. Conventional tillage practices were used, and fertilizer was applied following soil test recommendations. Trifluralin and Dual, as tank mix were incorporated into the soil prior to planting at the recommended rate to control weeds. Each cultivar will be harvested with two operations: **i)** manually and **ii**) mechanically with a common bean harvester when plants reach green pod stage and the pods expanded to fill 80 to 90 of the pod width. **i**) Manual harvesting - a section of the plot 3 m x 3 m will be harvested manually and the harvested plants will be brought to the laboratory and pods will be pulled by hand. The total pods from each plot from each cultivar will be weighed and recorded and presented as kg/ha.

Hundred pod samples will be taken at random and weighed and recorded as gram per 100 pods. Pod samples will be taken at random and the following parameters will be graded on a scale of 1 - 5 (1 = pods with 4 beans/pod, 2 = pods with 3 beans/pod; 3 = 2 beans/pods, 4 = one bean/pod; 5 = empty pods, and % defects pods (blemish and/or bruised pods) and pods from each scale will be weighed to determine the % marketable yield.

ii) The remaining section of the plot will be harvested with common bean picker. The pod yield and hundred pods will be recorded. Pod samples will be taken and graded as described above. Additionally, the time taken to harvest plots manually and/or mechanically will be recorder. A 30 kg pods samples will be taken at random and shelled using a modified bean sheller. The shelled beans will be weighed and graded for physical appearance (1 = qood quality beans 5 = severely blemished beans).

Objective 2: To determine the agronomical and architectural traits that is suitable to mechanical harvest

Agronomic traits- at the time of mechanical harvest, ten plants from each harvested plot will be randomly picked, and the following data will be recorded: number of branches plant^{-1}, number of nodes branch^{-1}, number of nodes mainstem^{-1}, mainstem height, mainstem internodes length, number of pods plant^{-1} (number of pods in the upper, middle, and lower third of a plant), number of beans pod^{-1}, 100 pod weight, and fresh green pod yield. The pods from each harvested plot will be pulled by hand and the weight will be recorded and presented as fresh green pod yield in kg ha^{-1}. Ten pods will be picked randomly from the 10 plants sampled from each genotype. Pod length, width, and thickness will be measured. Pod samples will be taken and graded on a scale 1 - 5 (1 = pods with 4 beans/pod, 2 = pods with 3 beans/pod; 3 = 2 beans/pods, 4 = one bean/pod;

5 = empty pods), and pods from each scale will be weighed to determine the % marketable yield, 25 shelled bean weight, and texture.

Chemical evaluations: The fresh green bean from the harvested pods will be shelled by hand. The fresh green bean will be ground and analyzed for total lipids, and protein, fatty acids and total sugar (sucrose, glucose and fructose) content. Data will be compiled and analyzed statistically and information will disseminated to end users through workshops and other educational activities.

III. INFORMATION DISSEMINATION:

Provided seeds to home gardeners and farmers and also assisted to home gardeners in preparing seed bed (Fig 3 & 4) and planting vegetable soybean seeds.

Fig 3. Patricia and Tadesse

Fig 4. Patricia Stansbury preparing field plot for planting vegetable soybean

Workshop- We plan to conduct workshop on vegetable soybean improvement, production and uses to cliental groups. The workshop is tentatively scheduled for September 12, 2006 at Virginia State University Extension Pavilion, Randolph Farm. Speakers who are expert on the vegetable soybean breeding, production, and utilization are already identified and informed as guest speakers. The information obtain from our visit to different regions of Hangzhou province of China in vegetable soybean breeding, production, processing and utilization will be presented and shared with the workshop participants.

IV. Other activities Accomplished:

Proposal preparation and submission:

We prepared and submitted a competitive proposal entitled: **"Vegetable soybean (Mau Dou) production, processing, and utilization"** for funding consideration to the Foreign Agricultural Service of the United States Department of Agriculture (USDA-FAS) on January 23, 2005. The proposed project was approved for funding. The main objective of the proposal is to build a long-term collaboration research and extension relationship between the agricultural programs at Virginia State University and Zheijaing Academy of Agricultural Sciences (ZAAS), Hangzhou China. The grants generated from this project will augment the travel expenses of the Virginia Department and Consumers Services funded project.

We also prepared and submitted entitled**: "Edamame**: **A potential Vegetable Crop to Virginia"** was also prepared and submitted to Virginia Agricultural Council for funding consideration on **January 30, 2006**. The project was funded for about $10,000 for half of the grant amount we requested. The main objectives of the proposal are to: (i) Identification and development of vegetable soybean cultivars with desirable nutritional qualities; (ii) Preparation of quality soybean roast nuts and other recipes; and (iii) Processing and Shelf-life Evaluation. The information obtained from the project will enhance the efficiency of soybean breeding program to develop new soybean cultivars specially adapted for fresh green use and/or soy nut production in the U.S. agricultural system. Research results will be summarized annually and submitted reports. Papers will be presented at scientific and production meetings, Southeast Virginia Annual Expo, nationally and internationally symposiums and seminars. Our target audiences will include farmers, industry representatives, news media, scientists, health

professionals, and students. Brochures will be prepared and distributed to farmers and interested public and manuscript submitted to appropriate scientific journals for publications.

Travel:

Currently the PI and Co-PIs of the project are visiting the Zhejiang Academy of Agricultural Sciences (ZAAS), to meet with their counter part and tour the various regions of vegetable soybean production and processing areas of Hangzhou province**.**

Equipment:

We have already purchased a Laptop computer. A request to purchase has been placed a field pea sheller which is proven to be suitable for shelling green vegetable soybean have been prepared and submitted to Agricultural research Director for approval.